Sociodemographic Differences Between Alcohol Use and Sickness Absence : Pooled Analysis of Four Cohort Studies

Ervasti, Jenni

2018-01

Ervasti , J , Kivimaki , M , Head , J , Goldberg , M , Airagnes , G , Pentti , J , Oksanen , T , Salo , P , Suominen , S , Jokela , M , Vahtera , J , Zins , M & Virtanen , M 2018 , ' Sociodemographic Differences Between Alcohol Use and Sickness Absence : Pooled Analysis of Four Cohort Studies ' , Alcohol & Alcoholism , vol. 53 , no. 1 , pp. 95-103 . https://doi.org/10.1093/alcalc/a

http://hdl.handle.net/10138/299268
https://doi.org/10.1093/alcalc/agx079

unspecified
publishedVersion

Alcohol and Alcoholism, 2018, 53(1) 95–103
doi: 10.1093/alcalc/agx079
Advance Access Publication Date: 13 October 2017
Article

OXFORD

Article

Sociodemographic Differences Between Alcohol Use and Sickness Absence: Pooled Analysis of Four Cohort Studies

Jenni Ervasti[1,*], Mika Kivimäki[1,2,3], Jenny Head[2], Marcel Goldberg[4,5], Guillaume Airagnes[6,7], Jaana Pentti[3], Tuula Oksanen[1], Paula Salo[1,8], Sakari Suominen[9], Markus Jokela[10], Jussi Vahtera[11], Marie Zins[4,5,12], and Marianna Virtanen[1]

[1]Finnish Institute of Occupational Health, PB 40, 00032 TYÖTERVEYSLAITOS, Helsinki, Finland, [2]Department of Epidemiology and Public Health, University College London, 1-19 Torrington Place, London WC1E 7HB, UK, [3]Clinicum, University of Helsinki, PB 63, 00014 Helsingin yliopisto, Helsinki, Finland, [4]French National Institute of Health and Medical Research (INSERM), Population-based Cohorts Unit, INSERM, 101, rue de Tolbiac, 75013 Paris, Villejuif, France, [5]French National Institute of Health and Medical Research (INSERM), Research Unit 1168 Aging and Chronic Diseases—Epidemiological and Public Health Approaches, INSERM, 101, rue de Tolbiac, 75013 Paris, Villejuif, France, [6]Faculty of Medicine, Universite Paris Descartes, 15, rue de l'école de médecine, 75006 Paris, France, [7]Department of Psychiatry and Addictology, AP-HP, Hôpitaux Universitaires Paris Ouest, 75015 Paris, France, [8]Department of Psychology, University of Turku, 20014 Turun yliopisto, Finland, [9]University of Turku, Finland and University of Skövde, Box 408541 28 Skövde, Sweden, [10]Medicum, University of Helsinki, PB 63, 00014 Helsingin yliopisto, Helsinki, Finland, [11]University of Turku and Turku University Hospital, 20014 TURUN YLIOPISTO, Turku, Finland, and [12]University Versailles Saint Quentin en Yvelines, 47 boulevard Vauban 78280 Guyancourt, Paris, France

*Corresponding author: Finnish Institute of Occupational Health, Helsinki, Finland. E-mail: jenni.ervasti@ttl.fi

Received 5 June 2017; Revised 23 August 2017; Editorial Decision 17 September 2017; Accepted 18 September 2017

Abstract

Aims: We examined differences in sickness absence in relation to at-risk drinking and abstinence, taking into account potential changes in consumption.

Methods: We used individual-participant data (n = 46,514) from four prospective cohort studies from Finland, France and the UK. Participants responded to a survey on alcohol use at two time points 4–6 years apart, and were linked to records of sickness absence for an ~6-year follow-up after the latter survey. Abstainers were those reporting no alcohol use in either survey. At-risk drinkers at T1 were labelled as 'former', at-risk drinkers at T2 as 'current' and at-risk drinkers at both times as 'consistent' at-risk drinkers. The reference group was low-risk drinkers at both times. Study-specific analyses were stratified by sex and socioeconomic status (SES) and the estimates were pooled using meta-analysis.

Results: Among men (n = 17,285), abstainers (6%), former (5%), current (5%) and consistent (7%) at-risk drinkers had an increased risk of sickness absence compared with consistent low-risk drinkers (77%). Among women (n = 29,229), only abstainers (12%) had a higher risk of sickness absence compared to consistent low-risk drinkers (74%). After adjustment for lifestyle and health, abstaining from alcohol was associated with sickness absence among people with intermediate and high SES, but not among people with low SES.

Conclusions: The U-shaped alcohol use—sickness absence association is more consistent in men than women. Abstinence is a risk factor for sickness absence among people with higher rather

than lower SES. Healthy worker effect and health selection may partly explain the observed differences.

Short summary: In a pooled analysis from four cohort studies from three European countries, we demonstrated a U-shaped association between alcohol use and sickness absence, particularly among men. Abstinence from alcohol was associated with increased sickness absenteeism among both sexes and across socioeconomic strata, except those with low SES.

INTRODUCTION

Sickness absence, that is absence from work due to own illness, is an important measure of work-related functioning and a predictor of permanent work disability and premature mortality (Kivimaki *et al.*, 2003, 2008; Head *et al.*, 2008; Vahtera *et al.*, 2004). There is growing evidence suggesting that the association between alcohol use and sickness absence is curvilinear rather than linear with increased sickness absence rates seen both among at-risk drinkers and abstainers (Marmot *et al.*, 1993; Upmark *et al.*, 1999; Laaksonen *et al.*, 2009; Vasse *et al.*, 1998; Vahtera *et al.*, 2002). To date, however, few studies have had the possibility of using repeat data on alcohol use or examined whether the U-shaped association varies between subgroups (Schou and Moan, 2016).

Women may be more vulnerable to the adverse effects of at-risk alcohol use, but empirical evidence on sex differences in relation to sickness absence is mixed (Johansson *et al.*, 2009; Norstrom and Moan, 2009; Salonsalmi *et al.*, 2009; Hensing *et al.*, 2011; Schou *et al.*, 2014; Morois *et al.*, 2017). Previous research has also established an inverse socioeconomic gradient in both at-risk drinking (Mackenbach *et al.*, 2008; Johansson *et al.*, 2009; Probst *et al.*, 2014) and sickness absence (Kristensen *et al.*, 2010; Sumanen *et al.*, 2015), but few studies to date have examined whether the association between alcohol use and sickness absence differs according to socioeconomic status (SES). It has been suggested that flexible working hours and other flexible work arrangements often found in higher socioeconomic positions could hide the absence or inefficiency due to hangover and, thus, weaken the association between at-risk alcohol use and sickness absence in those groups of employees (Schou and Moan, 2016). However, we found only one study to test this hypothesis, suggesting that the association between alcohol consumption and sickness absence may be more pronounced for low-educated men (Johansson *et al.*, 2009). A major limitation in all those studies is the relatively small sample size and the scarcity of longitudinal data on alcohol use precluding assessment of long-term drinking patterns or the temporal order between alcohol use and sickness absence (Schou and Moan, 2016). There are known cultural differences in alcohol use (Kuendig *et al.*, 2008; Kuntsche *et al.*, 2015) and international differences in sickness absence practices and social insurance systems. Thus, in order to achieve more generalizable results, it is important to examine the alcohol use—sickness absence association in data from multiple countries.

In this study, we examined whether the association between alcohol use and sickness absence varies between men and women or by SES. To address some of the limitations in previous studies, we measured alcohol consumption repeatedly; distinguished long-term at-risk drinking from former and current at-risk drinking, abstinence and long-term moderate (low-risk) alcohol consumption; used longitudinal data with assessments of alcohol use preceding the follow-up for sickness absences; and included data from France, the UK and Finland.

METHODS

Study populations

Data were derived from four cohort studies: (a) a representative population sample of Finnish working-age adults participating in the Health and Social Support (HeSSup) study, Finland (Paljarvi *et al.*, 2013); (b) the Whitehall II study of government employees, the UK (Marmot and Brunner, 2005); (c) the employees of the national gas and electricity company of the GAZEL study, France (Goldberg *et al.*, 2015); and (d) the municipal employees of the Finnish Public Sector (FPS) study, Finland (Vahtera *et al.*, 2002). Ethical approval for the HeSSup study was obtained from Turku University Central Hospital Ethics committee, for Whitehall II study from the University College London Medical School committee on the ethics of human research, for GAZEL study from the Inserm Ethics committee, and for FPS from the Ethics committee of the Hospital District of Helsinki and Uusimaa.

From all four cohorts, we included respondents who were alive, not retired before the start of the follow-up, and had data on all studied variables from the surveys that were included in this study design. The eligible population in each study comprised the respondents of a baseline and follow-up questionnaire survey. In the HeSSup study, the survey years were 1998 and 2003 (n = 10,511), in the GAZEL study 1993 and 1997 (n = 6873), in the Whitehall II study phases 1 (1985–1988) and 3 (1991–1994) (n = 4160), and in the FPS 2000–2002 and 2004 (n = 24,970). We demonstrate the study design in Fig. 1. The follow-up time (time at-risk for sickness absence) in all studies was until disability or old-age pension, death or end of sickness absence follow-up, whichever came first.

Alcohol use

Alcohol use was requested by questions on weekly consumption by type of drink. We converted drinks/alcohol units to grams of pure alcohol. One drink/alcohol unit was estimated as 12 g of alcohol (=EUR unit), except in the Whitehall II study, where one unit was estimated as 8 g (=UK unit). Alcohol intake was categorized into 'abstainers', 'moderate use' (a maximum of 140 g equalling 1–11 EUR units or 1–17 UK units for women and 280 g equalling 1–23 EUR units or 1–34 UK units for men per week), and 'at-risk drinking' (>140 g equalling >11 EUR units or >17 UK units for women and >280 g or >23 EUR units or >34 UK units for men per week). The cut-points of at-risk drinking were based on the Finnish Current Care Guidelines (Alho *et al.*, 2015). These cut-points are not used in the UK, where a maximum of 14 weekly units (1 unit = 8 g of pure alcohol totalling 112 g per week) have been defined as cut-point for moderate drinking for both sexes (Drinkaware, 2016). We performed sensitivity analyses with UK's recommended limits.

Alcohol use was measured twice (two survey responses) 4–6 years apart, depending on the cohort (Fig. 1). Based on these two

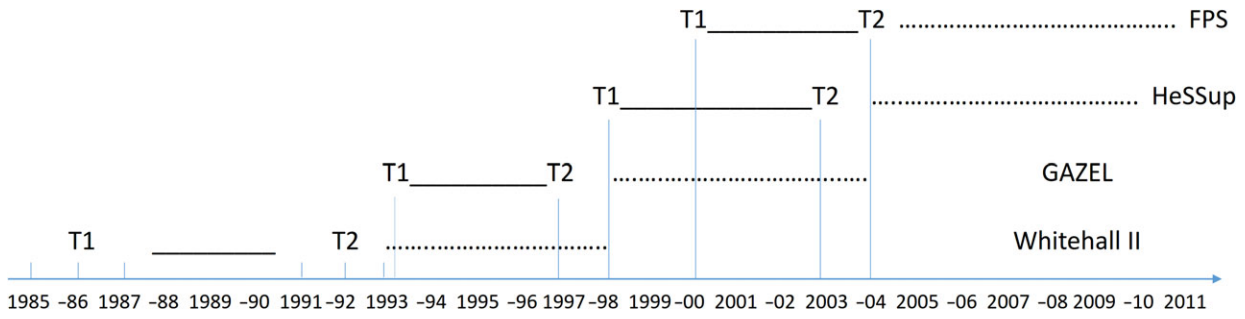

Fig. 1. Timeline and study design in each cohort. T1 and T2 mark the two surveys. Follow-up time for sickness absence is indicated by dotted lines.

measurements, we classified the respondents as 'consistent abstainers' (no alcohol use in either survey), 'consistent low-risk users' (moderate use reported in both surveys), 'former at-risk users' (heavy use reported at baseline survey, but less than that in the follow-up survey), 'consistent at-risk users' (heavy use reported in both surveys) and 'current at-risk users' (heavy use at follow-up survey only).

Sickness absence

Sickness absence was measured as the number of sickness absence days per follow-up year. In HeSSup and FPS, register information on the dates of sickness absence exceeding 9 days was retrieved from the Social Insurance Institution of Finland. These data included all absence episodes lasting for at least 10 days, from the date that illness began (the first day of absence from work) until the sickness absence benefit ended. The follow-up was from 1 January 2004 until 31 December 2010 in HeSSup and from 1 January 2005 until 31 December 2011 in FPS. Neither Hessup nor FPS covered short-term sickness absences. In Whitehall II, information on all sickness absence days, irrespective of the length of the absence, was obtained from the Civil Service (employer) records for those employees who gave consent to monitor their sickness absence for a follow-up period from phase 3 until the end of 1998. In GAZEL, the information on the total number of annual days of sickness absence was obtained from the employer's records for a follow-up period from 1 January 1998 until 31 December 2004 (Fig. 1). In all countries included in this study, sickness absence benefits are based on a physician's certificate of diagnosed illness, which causes work disability. In Finland, alcohol dependence does not entitle a person to sickness absence benefits, but having such a condition does not preclude benefits if there is a comorbid condition causing work disability. In the UK and France, employees are entitled to sickness absence benefits regardless of the cause. The sickness absence schemes and alcohol-related practices are detailed in Supplementary Table 1.

Covariates and potential effect modifiers

Covariates, measured at T2, were SES, sex, age, smoking, body mass index, somatic disease and psychological distress. SES and sex were also tested as effect modifiers.

SES, divided into three groups, was based on occupational class, except for HeSSup, where information on occupational class was unavailable and SES was based on vocational education. In FPS and GAZEL, SES was based on register data from employers, and in HeSSup and Whitehall, it was based on self-reports. High SES included administrators, managers, experts, specialists and in HeSSup, those with university/polytechnic education. Intermediate SES included skilled non-manual occupations, such as office work, customer service, sales work, hospital nurses and in HeSSup, those with college-level education. Low SES included manual workers, such as construction workers, manufacturing, transportation, and in HeSSup, those with vocational school, vocational course, apprenticeship training or no vocational education.

Information on sex and age were either from employers' or other registers, or self-reported. Age was treated as a continuous variable in the analyses. Smoking and psychological distress were self-reported in all studies. Smoking was dichotomized into current smoker or non-smoker (including never and ex-smokers). Body mass index (BMI = weight in kg divided by height in m^2) was self-reported in HeSSup, GAZEL and FPS. In the Whitehall II, BMI was derived from measures taken at clinical examinations. BMI was categorized as <25, 25–29 and 30 or more (obesity).

In Whitehall II and FPS studies, psychological distress was measured by the 12-item General Health Questionnaire (GHQ-12) (Goldberg *et al.*, 1997; Aalto *et al.*, 2012). In the GHQ-12, respondents rate the extent to which they are affected by each of the 12 symptoms (1 = not at all, 2 = as much as usual, 3 = slightly more than usual, 4 = much more than usual). Participants with a rating of 3 or 4 in at least four items of the total measure were coded as cases of psychological distress. In GAZEL, we used the Emotional Reaction scale from the Nottingham Health Profile (NHP) measured in 1995 (Bucquet *et al.*, 1990). The NHP Emotional Reaction scale has nine items, which are weighted to indicate their perceived severity (range 0–100). Higher scores indicate higher dysfunction. We coded upper quartile values as cases of psychological distress, to which we added respondents reporting depression in 1997 (even if they were not cases in 1995). In HeSSup, we used Beck's Depression Inventory to identify psychological distress (Aalto *et al.*, 2012; Kliem *et al.*, 2014). Those with moderate to severe depression were coded as cases for psychological distress, and those with minimal to mild as non-cases.

In HeSSup and FPS, somatic chronic disease were chronic stage 2 hypertension, coronary artery disease, diabetes, asthma or chronic obstructive pulmonary disease, rheumatoid arthritis and cancer. In GAZEL and Whitehall II, the list also included stroke. These data were register-based in FPS and HeSSup, from clinical examinations and self-reports in Whitehall II, and self-reported in GAZEL.

Statistical analysis

We used a two-stage meta-analysis (Riley *et al.*, 2010). In the first stage, we used negative binomial regression analysis to examine the rate ratios (RR with their 95% confidence intervals [CI]) of sickness absence for no alcohol use, former at-risk drinking, and consistent at-risk drinking, compared to consistent low-risk drinking. We further stratified these data by sex and SES. All models were adjusted

for sex and SES (where applicable), and age, smoking, BMI, somatic disease, and psychological distress. The study-specific results were analysed using SAS 9.4 (Cary, NC).

In the second stage of the meta-analysis, study-specific estimates were pooled in fixed effects meta-analysis with Stata 13 software. We examined heterogeneity between the estimates using the I^2 statistic. We conducted metaregression to identify heterogeneity of effect by sex and SES, i.e. test effect modifications.

RESULTS

In HeSSup, 78% of the respondents were classified as consistent low-risk drinkers, 9% as consistent abstainers, 3% as former at-risk drinkers, 3% as consistent at-risk drinkers and 5% as current at-risk drinkers. The corresponding percentages were 69, 7, 6, 12 and 6 for GAZEL; 76, 12, 4, 5 and 3 for Whitehall II; and 75, 10, 4, 6 and 5 for FPS. Consistent at-risk drinkers were the oldest in all cohorts except for Whitehall II, where abstainers were the oldest. Abstainers were more often women and had low SES. In Whitehall, chronic somatic disease was most prevalent among abstainers, whereas in other cohorts, the differences were smaller. Psychological distress was linked with at-risk drinking in all cohorts except in GAZEL, where it was linked with abstaining from alcohol. Smoking was associated with at-risk drinking in all cohorts. Abstainers had the highest observed (unadjusted) mean of annual sickness absence days per person-year in GAZEL (14 days), Whitehall II (15 days) and FPS (13 days) whereas in HeSSup, highest mean was among consistent at-risk drinkers (10 days). The mean follow-up time was shortest in GAZEL (3.1–3.7 years), and longest in HeSSup and FPS (5.9–6.7 years) (Table 1).

Risk of sickness absence by alcohol use

Figure 2 shows the results on sickness absence in each cohort and the pooled estimates according to alcohol use and compared with consistent low-risk drinking (pooled n = 34,884 [75%]). Abstainers had a higher risk of sickness absence (pooled RR = 1.30, 95% CI: 1.20–1.40). Also former at-risk drinkers (RR = 1.19, 95% CI: 1.07–1.33) and current at-risk drinkers (RR = 1.13, 95% CI: 1.02–1.26) had a higher risk of sickness absence compared with consistent low-risk drinkers, but consistent at-risk drinkers did not have a higher risk of sickness absence (pooled RR = 1.05, 95% CI: 0.95–1.15) compared with consistent low-risk drinkers. Within groups of alcohol use, significant heterogeneity was observed between the studies among current at-risk drinkers (I^2 = 82%, P = 0.001) and consistent at-risk drinkers (I^2 = 67%, P = 0.03). Overall, there was significant heterogeneity between groups of alcohol use (P = 0.005, metaregression P = 0.09), and the overall between-study heterogeneity was high (I^2 = 63%, P < 0.001).

When using UK-recommended cut-point of at-risk drinking, only abstainers (RR = 1.29, 95% CI: 1.20–1.39) and former at-risk drinkers (RR = 1.15, 95% CI: 1.05–1.26) had a higher risk of sickness absence compared to consistent low-risk drinkers (Supplementary Fig. 1).

Sex-stratified analysis

We then performed the analyses stratified by sex (metaregression P for sex interaction = 0.02). The association with absenteeism between both abstinence and at-risk drinking were stronger among men than women. Figure 3a shows the results among men comparing the risk among abstainers and at-risk drinkers with consistent low-risk drinking (pooled n = 13,389 [77%]). Among men, abstaining and all types of at-risk drinking were associated with a higher risk of sickness absence. No significant heterogeneity was observed between groups of alcohol use (P = 0.28; metaregression P = 0.42), but the overall between-study I^2 value was 54%, P = 0.006. Significant heterogeneity between the studies was observed for consistent (I^2 = 76%, P = 0.006) and current at-risk drinking (I^2 = 75%, P = 0.007).

Figure 3, Panel b shows the results among women comparing the risk of sickness absence among abstainers and at-risk drinkers with consistent low-risk drinking (pooled n = 13,389 [77%]). Among women, only abstaining (RR = 1.24, 95% CI: 1.14–1.34) was associated with a higher risk of sickness absence. The estimates in each group of alcohol use differed from each other (heterogeneity between groups P = 0.001; metaregression P = 0.003), and there was also considerable heterogeneity between the studies (overall I^2 = 54%, P = 0.006). Within groups of alcohol use, significant heterogeneity between the studies was observed for former at-risk drinking women (I^2 = 63%, P = 0.04). The results were largely similar when using UK-recommended cut-point of at-risk drinking, as shown in Supplementary Fig. 2.

Socioeconomic disparities in the alcohol use—sickness absence association

Next, we studied the alcohol use—sickness absence association stratified by SES (metaregression for effect modification by SES P = 0.87). Among people with low SES (n = 8613), alcohol use was not associated with sickness absence either among abstainers or at-risk drinkers compared with low-risk drinkers, as shown in Fig. 4a. There was no heterogeneity between groups of alcohol use (P = 0.83, metaregression P = 0.39), and no heterogeneity between the studies among people with low SES (overall I^2 = 0%, P = 0.58).

As shown in Fig. 4b, differences between groups of alcohol use were observed among people with intermediate SES (n = 15,720). Among them, abstainers (RR = 1.41, 95% CI: 1.26–1.57) and former at-risk drinkers (RR = 1.36, 95% CI: 1.16–1.61) had a higher risk of sickness absence than low-risk drinkers, whereas consistent or current at-risk drinking were not associated with sickness absence. We observed significant heterogeneity between groups of alcohol use (P = 0.004), which was confirmed with metaregression (P = 0.007). There was significant between-study heterogeneity among people with intermediate SES (overall I^2 = 47%, P = 0.02).

Among people with high SES (n = 22,181), abstainers had a higher risk of sickness absence than consistent low-risk drinkers (RR = 1.28, 95% CI: 1.11–1.47), without heterogeneity between studies (I2 = 0%, P = 0.66). The risk among all types of at-risk drinkers was non-significant. However, considerable between-study heterogeneity was observed among current at-risk drinkers (I^2 = 76%, P = 0.006) (Fig. 4c). No differences in the estimates between groups of alcohol use were observed (heterogeneity between groups of alcohol use was P = 0.25, metaregression P = 0.29). Overall I^2 was 47%, P = 0.02, indicating overall heterogeneity between studies among people with high SES. The results were largely similar when using the UK-recommended cut-point for at-risk drinking, as shown in Supplementary Fig. 3.

The largest differences between SES groups were observed among abstainers. Thus, we studied abstainers stratified by SES. Supplementary Fig. 4 shows that there was marginally significant heterogeneity between SES groups (P = 0.03; metaregression P = 0.06). Abstainers with intermediate to high SES had a higher risk of sickness absence than those with low SES.

Table 1. Characteristics of the four cohorts by alcohol use

	HeSSup	GAZEL	Whitehall II	FPS
No alcohol use	*n* = 978 (9%)	*n* = 488 (7%)	*n* = 502 (12%)	*n* = 2525 (10%)
Mean age (SD)	43 (10.8)	50 (3.4)	50 (5.8)	49 (8.3)
Men (%)	28	41	50	11
Women (%)	72	59	50	89
High SES (%)	23	24	13	47
Intermediate SES (%)	30	59	48	34
Low SES (%)	47	17	39	19
Chronic somatic disease (%)	13	19	40	17
Psychiatric distress (%)	3	35	26	2
Smokers (%)	14	15	14	10
BMI > 30 (%)	14	9	14	16
Mean days of sickness absence/person-year	9.0	14.3	15.2	12.6
Mean follow-up time, years (SD)	6.4 (1.5)	4.2 (2.3)	4.4 (2.5)	5.9 (1.9)
Consistent low-risk drinking	*n* = 8236 (78%)	*n* = 4748 (69%)	*n* = 3146 (76%)	*n* = 18754 (75%)
Mean age (SD)	42 (10.7)	51 (2.9)	49 (5.7)	48 (8.2)
Men (%)	44	76	78	20
Women (%)	56	24	22	80
High SES (%)	33	43	46	58
Intermediate SES (%)	32	49	44	28
Low SES (%)	35	9	10	14
Chronic somatic disease (%)	11	17	31	15
Psychiatric distress (%)	3	26	27	24
Smokers (%)	19	16	12	14
BMI > 30 (%)	11	8	8	12
Mean days of sickness absence/person-year	6.4	8.3	7.0	9.9
Mean follow-up time, years (SD)	6.5 (1.2)	3.7 (2.2)	4.5 (2.5)	6.2 (1.7)
Former at-risk drinking	*n* = 431 (3%)	*n* = 422 (6%)	*n* = 175 (4%)	*n* = 1019 (4%)
Mean age (SD)	40 (11.5)	51 (2.8)	48 (5.4)	47 (8.4)
Men (%)	30	81	73	20
Women (%)	70	19	27	80
High SES (%)	29	42	47	58
Intermediate SES (%)	32	50	44	27
Low SES (%)	39	8	9	15
Chronic somatic disease (%)	14	18	35	19
Psychiatric distress (%)	4	28	34	29
Smokers (%)	33	21	22	26
BMI > 30 (%)	13	10	10	15
Mean days of sickness absence/person-year	7.8	9.1	8.4	11.7
Mean follow-up time, years (SD)	6.6 (1.2)	3.5 (2.2)	4.4 (2.3)	6.2 (1.7)
Consistent at-risk drinking	*n* = 352 (3%)	*n* = 791 (12%)	*n* = 199 (5%)	*n* = 1382 (6%)
Mean age (SD)	46 (9.0)	52 (2.6)	48 (5.2)	50 (7.2)
Men (%)	34	85	73	23
Women (%)	66	15	27	77
High SES (%)	30	38	38	65
Intermediate SES (%)	33	51	57	22
Low SES (%)	38	11	5	13
Chronic somatic disease (%)	13	19	38	19
Psychiatric distress (%)	7	25	30	29
Smokers (%)	39	31	30	25
BMI > 30 (%)	12	9	11	17
Mean days of sickness absence/person-year	9.9	8.7	9.8	11.4
Mean follow-up time, years (SD)	6.4 (1.4)	3.1 (2.1)	4.6 (2.3)	6.1 (1.7)
Current at-risk drinking	*n* = 514 (5%)	*n* = 424 (6%)	*n* = 138 (3%)	*n* = 1290 (5%)
Mean age (SD)	42 (9.3)	51 (3.0)	47 (5.1)	47 (7.9)
Men (%)	31	78	75	19
Women (%)	69	22	25	81
High SES (%)	27	42	51	59
Intermediate SES (%)	35	46	43	27
Low SES (%)	38	11	6	14
Chronic somatic disease (%)	10	22	32	16
Psychiatric distress (%)	5	26	24	30

Continued

Table 1. Continued

	HeSSup	GAZEL	Whitehall II	FPS
Smokers (%)	39	22	19	25
BMI > 30 (%)	13	9	15	13
Mean days of sickness absence/person-year	7.7	11.4	7.1	11.7
Mean follow-up time, years (SD)	6.6 (1.2)	3.6 (2.2)	4.8 (2.3)	6.3 (1.6)

SES = socioeconomic status; BMI = body mass index; SD = standard deviation.

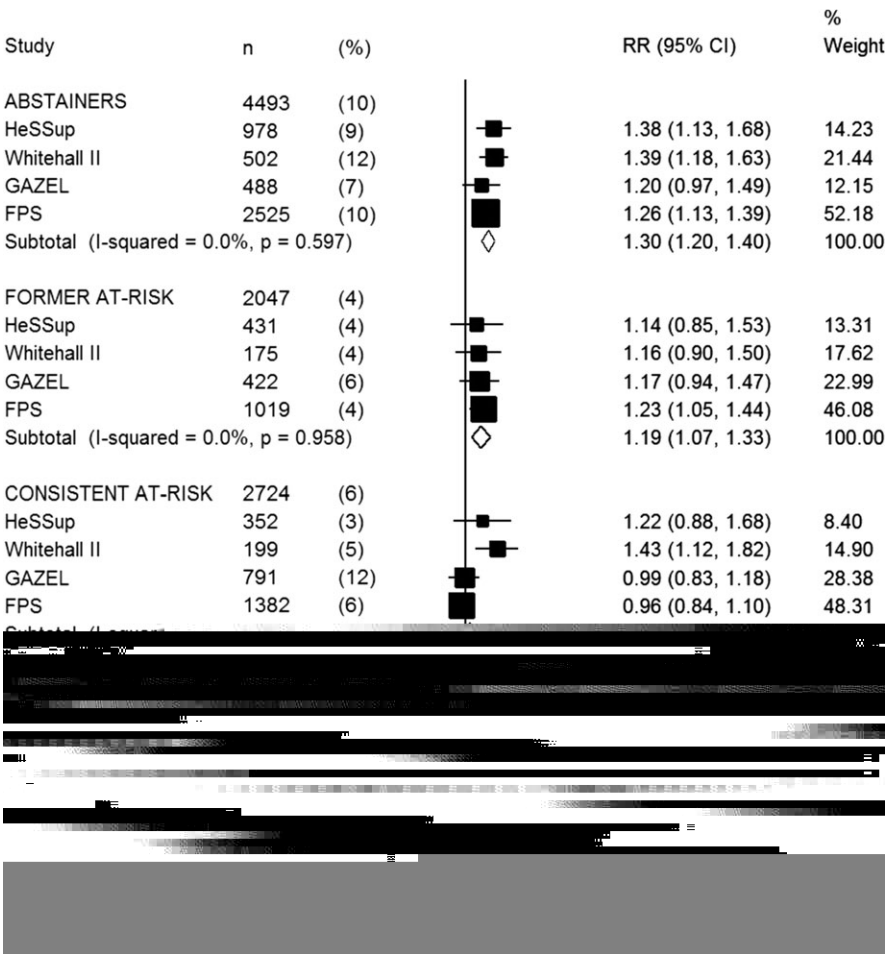

Fig. 2. Rate ratios (95% CIs) for the association between alcohol use and sickness absence in each study cohort. Abstainers, former, consistent, and current at-risk drinkers are compared to consistent low-risk drinkers. Adjusted for age, sex, socioeconomic status, smoking, body mass index and physical and mental morbidity.

DISCUSSION

In this pooled analysis of individual-level data from four cohorts in three European countries, we found evidence of a U-shaped association between the level of alcohol use and sickness absence among men, which was independent of age, SES, health behaviours and psychiatric and somatic morbidity. Among women, abstainers had a higher risk of sickness absence than consistent low-risk drinkers. Moreover, we observed more differences between groups of alcohol use among people with intermediate to high SES than low SES.

Our findings add to previous evidence regarding an increased risk of sickness absence among abstainers compared with consistent low-risk drinkers (Marmot *et al.*, 1993; Upmark *et al.*, 1999; Laaksonen *et al.*, 2009; Vasse *et al.*, 1998; Vahtera *et al.*, 2002). There is biochemical and observational evidence suggesting beneficial effects of moderate alcohol use on cardiovascular disease mortality (Poikolainen *et al.*, 2005; Edelman and Fiellin, 2016; Roerecke and Rehm, 2012). Our study lends support for this hypothesis in relation to sickness absence, although we were only able to ascertain abstinence during the preceding 4–6 years rather than to control for lifetime alcohol use. Thus, while we adjusted our analyses for chronic somatic illness and mental distress at baseline, we cannot completely rule out the hypothesis that the association between abstaining and increased sickness absence could be due to health selection that is the fact that these people could be former heavy drinkers or people abstaining due to health reasons. However, our

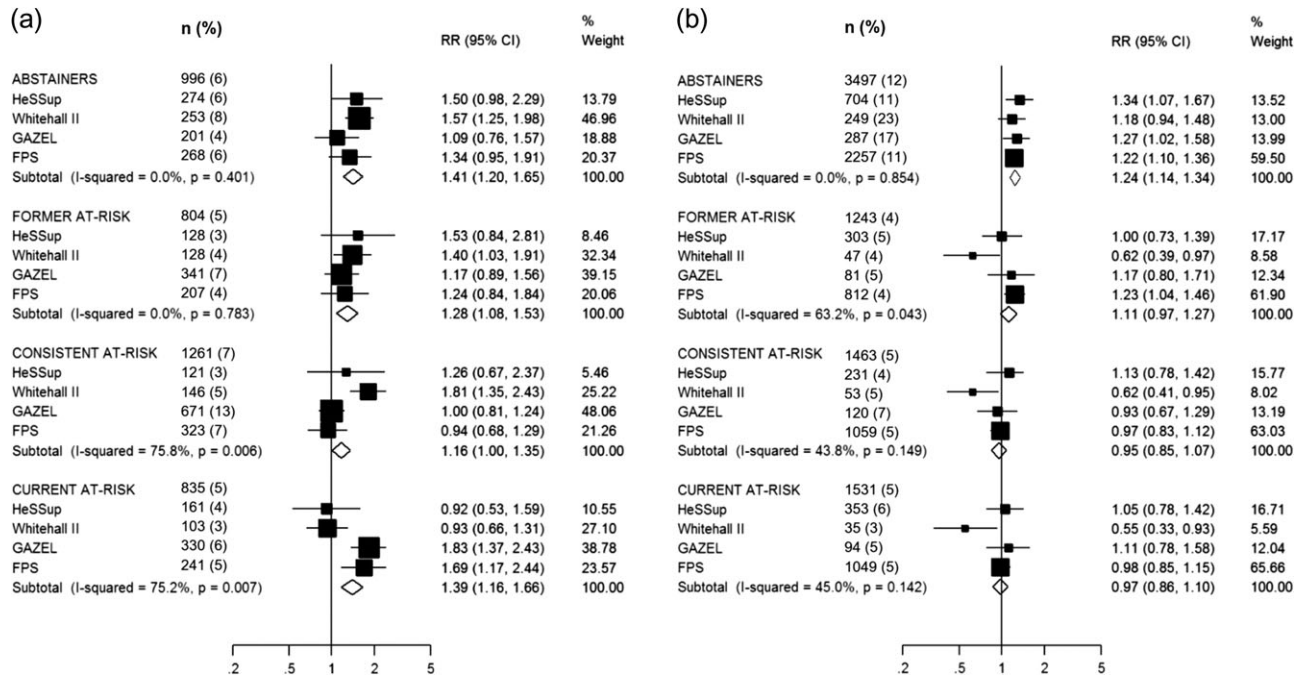

Fig. 3. Rate ratios (95% CIs) for the association between alcohol use and sickness absence in each study cohort among (**a**) men and (**b**) women. Consistent abstainers, former, consistent and current at-risk drinkers are compared to consistent low-risk drinkers. Adjusted for age, socioeconomic status, smoking, body mass index and physical and mental morbidity.

Fig. 4. Rate ratios (95% CIs) for the association between alcohol use and sickness absence in each study cohort among (**a**) low SES, (**b**) intermediate SES and (**c**) high SES. Consistent abstainers, former, consistent and current at-risk drinkers are compared to consistent low-risk drinkers. Adjusted for age, sex, smoking, body mass index and physical and mental morbidity.

results correspond to an earlier study among middle-aged women, where consistent moderate drinkers had the best self-rated health even after controlling for chronic somatic diseases, depression and health behaviour-related factors (Powers and Young, 2008). In that study, consistent abstaining could be assured 8 years backwards. There may still be genetic confounding accounting for the association between abstaining and increased risk of sickness absence, as suggested by a recent twin study (Ostby *et al.*, 2016).

In the total population, while at-risk drinking at baseline (former at-risk) or at follow-up (current at-risk) were associated with an increased risk of sickness absence, being at-risk drinker at both times (consistent at-risk), was not associated with sickness absence. This may be explained by healthy worker effect, if participants to whom consistent at-risk drinking causes health problems are selected out from labour market, that is, if they retire early or become unemployed. Then, the adverse health effects are not seen in absence from work due to illness.

We found that the alcohol use—sickness absence association was different among men and women so that at-risk drinking men had a higher risk of sickness absence than at-risk drinking women. Previous evidence has been rather diverse. Some studies have found women more vulnerable (Hensing *et al.*, 2011), some found men more vulnerable (Norstrom, 2006; Norstrom and Moan, 2009; Morois *et al.*, 2017; Schou *et al.*, 2014) and some have not found a

sex difference (Upmark *et al.*, 1999; Salonsalmi *et al.*, 2009; Vahtera *et al.*, 2002). Earlier studies have suggested that possible explanation for men's excess risk of sickness absence might be that within the at-risk group, men have higher and more unhealthy alcohol consumption than women, such as heavy episodic drinking episodes (Schou *et al.*, 2014). Moreover, in our main analyses, we used lower limit of at-risk use for women than men. It is noteworthy that in general, women have more sickness absence than men, but the contribution of alcohol seems more pronounced among men. However, women with alcohol use disorder have higher mortality risk than men with alcohol use disorder (Roerecke and Rehm, 2013).

The decision to quit or reduce drinking is likely to be driven by health impairment. In our study, men who had previously been at-risk drinkers but had reduced their drinking, had an increased risk of sickness absence compared to consistent low-risk drinkers. This corresponds to a previous study in which men with former problem drinking had a higher risk of sickness absence than men without a history of problem drinking (Salonsalmi *et al.*, 2015). It thus seems that health selection plays a role in the association between reducing alcohol intake and sickness absence, at least among men.

The differences between groups of alcohol use were larger among people with intermediate to high SES than among low SES. Abstaining from alcohol was a particular risk factor for sickness absence among people with intermediate to high SES, but not among those with low SES. Thus, our study with medically certified all-cause sickness absence, did not support the hypothesis that higher socioeconomic position would hide alcohol-related absenteeism (Schou and Moan, 2016). Future studies should examine this is greater detail with shorter-term absences.

Our study has several strengths including a prospective design, measuring alcohol use twice over time allowing us to assess change, and reliable register-based sickness absence data. In earlier studies with a single-point measurement of alcohol use, those who have been at-risk drinkers for a long time cannot be separated from those who have been at-risk drinkers for a short time only. To strengthen the design, we separated current and consistent at-risk drinkers, among whom the health consequences of drinking should be emphasized. To our knowledge, only one previous study has used repeated measures of alcohol use in studying sickness absences (Salonsalmi *et al.*, 2015). We were also able to control for many confounding factors, such as lifestyle and morbidity. There is a strong link between alcohol and many non-communicable diseases, where these diseases are causally affected by alcohol (Rehm *et al.*, 2009; Parry *et al.*, 2011). By controlling for (some of) these diseases, we were able to show that the U-shaped association between alcohol and sickness absence observed among men was not totally due to the overrepresentation of chronically ill employees in some groups of alcohol use.

As to the limitations, our analyses did not adjust for physical or psychosocial work environment. We, however, adjusted for SES which can be considered a proxy for physical as well as psychosocial work environment. Furthermore, previous studies have found that psychosocial work environment contributes little to the association between alcohol use and sickness absence (Vasse *et al.*, 1998; Salonsalmi *et al.*, 2009). Another limitation is that we used self-reported alcohol use, which is often an underestimate (Vahtera *et al.*, 2002; Laaksonen *et al.*, 2009). The found associations could thus be underestimated if actual at-risk drinkers were included in low-risk group. As our results were robust to different cut-points of at-risk drinking, we find this kind of bias unlikely. A further limitation was that we were unable to differentiate between lifelong abstainers and current abstainers. In a previous study from FPS data, both lifetime and current absenteeism were linked with higher risk of sickness absence (Vahtera *et al.*, 2002). Finally, we had no information on short-term absence episodes in the two Finnish cohort studies, which may have caused some between-study heterogeneity. We observed significant between-study heterogeneity for current and consistent at-risk drinkers, particularly among men and people with high SES. This may decrease the strength of evidence in terms of generalizability across different cultural norms and sickness absence compensation procedures. However, no significant heterogeneity in study-specific estimates was observed for abstinence and sickness absence.

SUPPLEMENTARY MATERIAL

Supplementary material is available at *Alcohol and Alcoholism* online.

FUNDING

J.E. and M.V. received funding from the Academy of Finland (#292824, #258598). M.K. and J.V. are supported by the NordForsk (the Nordic Programme on Health and Welfare). J.H. is supported by the UK Economic and Social Research Council under the Lifelong Health and Wellbeing Cross-Council Programme initiative (ES/L002892/1). The collection of data in the Whitehall II Study is supported by grants from the UK Medical Research Council (MR/K013351/1; G0902037), British Heart Foundation (RG/13/2/30098), and the US National Institutes of Health (R01HL36310, R01AG013196). The GAZEL Cohort Study was funded by Électricité de France–Gaz de France and French National Institute of Health and Medical Research, and received grants from the 'Cohortes Santé Trés Grande Infrastructure de Recherche Program', Agence nationale de la recherché (ANR-08-BLAN-0028) and Agence française de sécurité sanitaire de l'environnement et du travail (EST-2008/1/35).

CONFLICT OF INTEREST STATEMENT

Dr Guillaume Airagnes declares speaker fees from Lundbeck. All other authors report no conflict of interest.

REFERENCES

Aalto AM, Elovainio M, Kivimaki M, *et al.* (2012) The Beck Depression Inventory and General Health Questionnaire as measures of depression in the general population: a validation study using the Composite International Diagnostic Interview as the gold standard. *Psychiatry Res* **197**:163–71.

Alho H, Eskola K, Autti-Rämö I, *et al.* (2015) Alkoholiongelmaisen hoito. *Käypä hoito/Current Care Guidelines*, Vol. 2017: Duodecim.

Bucquet D, Condon S, Ritchie K. (1990) The French version of the Nottingham Health Profile. A comparison of items weights with those of the source version. *Soc Sci Med* **30**:829–35.

Drinkaware (2016) Alcohol limits and unit guidelines: Drinkaware.

Edelman EJ, Fiellin DA. (2016) In the clinic. Alcohol use. *Ann Intern Med* **164**:Itc1–16.

Goldberg DP, Gater R, Sartorius N, *et al.* (1997) The validity of two versions of the GHQ in the WHO study of mental illness in general health care. *Psychol Med* **27**:191–7.

Goldberg M, Leclerc A, Zins M. (2015) Cohort profile update: The GAZEL Cohort Study. *Int J Epidemiol* **44**:77–77g.

Head J, Ferrie JE, Alexanderson K, *et al.* (2008) Diagnosis-specific sickness absence as a predictor of mortality: the Whitehall II prospective cohort study. *Br Med J* **337**:a1469.

Hensing G, Holmgren K, Mardby AC. (2011) Harmful alcohol habits were no more common in a sample of newly sick-listed Swedish women and men compared with a random population sample. *Alcohol Alcohol* **46**:471–7.

Johansson E, Bockerman P, Uutela A. (2009) Alcohol consumption and sickness absence: evidence from microdata. *Eur J Public Health* **19**:19–22.

Kivimaki M, Head J, Ferrie JE, *et al.* (2003) Sickness absence as a global measure of health: evidence from mortality in the Whitehall II prospective cohort study. *Br Med J* **327**:364.

Kivimaki M, Head J, Ferrie JE, *et al.* (2008) Sickness absence as a prognostic marker for common chronic conditions: analysis of mortality in the GAZEL study. *Occup Environ Med* **65**:820–6.

Kliem S, Mossle T, Zenger M, *et al.* (2014) Reliability and validity of the Beck Depression Inventory-Fast Screen for medical patients in the general German population. *J Affect Disord* **156**:236–9.

Kristensen TR, Jensen SM, Kreiner S, *et al.* (2010) Socioeconomic status and duration and pattern of sickness absence. A 1-year follow-up study of 2331 hospital employees. *BMC Public Health* **10**:643.

Kuendig H, Plant MA, Plant ML, *et al.* (2008) Alcohol-related adverse consequences: cross-cultural variations in attribution process among young adults. *Eur J Public Health* **18**:386–91.

Kuntsche E, Wicki M, Windlin B, *et al.* (2015) Drinking motives mediate cultural differences but not gender differences in adolescent alcohol use. *J Adolesc Health* **56**:323–9.

Laaksonen M, Piha K, Martikainen P, *et al.* (2009) Health-related behaviours and sickness absence from work. *Occup Environ Med* **66**:840–7.

Mackenbach JP, Stirbu I, Roskam AJ, *et al.* (2008) Socioeconomic inequalities in health in 22 European countries. *N Engl J Med* **358**:2468–81.

Marmot M, Brunner E. (2005) Cohort profile: the Whitehall II study. *Int J Epidemiol* **34**:251–6.

Marmot MG, North F, Feeney A, *et al.* (1993) Alcohol consumption and sickness absence: from the Whitehall II study. *Addiction* **88**:369–82.

Morois S, Airagnes G, Lemogne C, *et al.* (2017) Daily alcohol consumption and sickness absence in the GAZEL cohort. *Eur J Public Health* **27**:482–8.

Norstrom T. (2006) Per capita alcohol consumption and sickness absence. *Addiction* **101**:1421–7.

Norstrom T, Moan IS. (2009) Per capita alcohol consumption and sickness absence in Norway. *Eur J Public Health* **19**:383–8.

Ostby KA, Czajkowski N, Knudsen GP, *et al.* (2016) Does low alcohol use increase the risk of sickness absence? A discordant twin study. *BMC Public Health* **16**:825.

Paljarvi T, Suominen S, Car J, *et al.* (2013) Socioeconomic disadvantage and indicators of risky alcohol-drinking patterns. *Alcohol Alcohol* **48**:207–14.

Parry CD, Patra J, Rehm J. (2011) Alcohol consumption and non-communicable diseases: epidemiology and policy implications. *Addiction* **106**:1718–24.

Poikolainen K, Vahtera J, Virtanen M, *et al.* (2005) Alcohol and coronary heart disease risk—is there an unknown confounder? *Addiction* **100**: 1150–7.

Powers JR, Young AF. (2008) Longitudinal analysis of alcohol consumption and health of middle-aged women in Australia. *Addiction* **103**:424–32.

Probst C, Roerecke M, Behrendt S, *et al.* (2014) Socioeconomic differences in alcohol-attributable mortality compared with all-cause mortality: a systematic review and meta-analysis. *Int J Epidemiol* **43**:1314–27.

Rehm J, Mathers C, Popova S, *et al.* (2009) Global burden of disease and injury and economic cost attributable to alcohol use and alcohol-use disorders. *Lancet* **373**:2223–33.

Riley RD, Lambert PC, Abo-Zaid G. (2010) Meta-analysis of individual participant data: rationale, conduct, and reporting. *Br Med J* **340**:c221.

Roerecke M, Rehm J. (2012) Alcohol intake revisited: risks and benefits. *Curr Atheroscler Rep* **14**:556–62.

Roerecke M, Rehm J. (2013) Alcohol use disorders and mortality: a systematic review and meta-analysis. *Addiction* **108**:1562–78.

Salonsalmi A, Laaksonen M, Lahelma E, *et al.* (2009) Drinking habits and sickness absence: the contribution of working conditions. *Scand J Public Health* **37**:846–54.

Salonsalmi A, Rahkonen O, Lahelma E, *et al.* (2015) Changes in alcohol drinking and subsequent sickness absence. *Scand J Public Health* **43**: 364–72.

Schou L, Moan IS. (2016) Alcohol use-sickness absence association and the moderating role of gender and socioeconomic status: a literature review. *Drug Alcohol Rev* **35**:158–69.

Schou LA, Storvoll EE, Moan IS. (2014) Alcohol-related sickness absence among young employees: gender differences and the prevention paradox. *Eur J Public Health* **24**:480–5.

Sumanen H, Lahti J, Lahelma E, *et al.* (2015) 12-year trends in occupational class differences in short sickness absence among young women. *Scand J Public Health* **43**:441–4.

Upmark M, Moller J, Romelsjo A. (1999) Longitudinal, population-based study of self reported alcohol habits, high levels of sickness absence, and disability pensions. *J Epidemiol Community Health* **53**:223–9.

Vahtera J, Pentti J, Kivimaki M. (2004) Sickness absence as a predictor of mortality among male and female employees. *J Epidemiol Community Health* **58**:321–6.

Vahtera J, Poikolainen K, Kivimaki M, *et al.* (2002) Alcohol intake and sickness absence: a curvilinear relation. *Am J Epidemiol* **156**:969–76.

Vasse RM, Nijhuis FJ, Kok G. (1998) Associations between work stress, alcohol consumption and sickness absence. *Addiction* **93**:231–41.